IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent Application

Applicant(s): Arun Kwangil Iyengar
Docket No.: YOR920010663US1
Serial No.: 10/629,284
Filing Date: July 29, 2003
Group: 2188
Examiner: Duc T. Doan

Title: Methods and Systems for Managing Persistent
Storage of Small Data Objects

<u>REPLY BRIEF</u>

Commissioner for Patents
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Sir:

The present Reply Brief is in response to the Examiner's Answer dated December 4, 2007, which was issued in response to the Appeal Brief filed by Applicant (hereinafter referred to as "Appellant") dated August 20, 2007 in which the final rejection of claims 1-28 of the above-identified application was appealed.

ARGUMENT

In addition to hereby reasserting the arguments made in their Appeal Brief, Appellant addresses each point raised by the Examiner in the "Response to Argument" section of the Examiner's Answer (pages 11-17).

Point (A) of the Examiner's Answer challenges Appellant's assertion that Rabii does not teach or suggest the notion of managing storage of objects of sizes smaller than a storage transfer unit.

In the Appeal Brief (at page 10), Appellant pointed out (as specified in the background section of the present application) that a key problem in data storage management is how to efficiently manage objects which are relatively small but need to be stored persistently, such as in disk storage rather than in main memory only, wherein one of the key issues for storing such objects is that the minimum unit of transfer (also referred to as a storage transfer unit), such as a sector, is often much larger than the minimum object size. As explained, a sector size may be more than a factor of two larger than some objects. This means that the disk storage system will transfer sectors between disk and main memory. When an object is much smaller than a sector, the disk storage system does not have a method for transferring just the object. The disk storage system has to transfer the entire sector (or sectors if the object is on a sector boundary) containing the object in order to access just the object.

Thus, the steps of the claimed invention are directed toward managing storage of "objects of sizes smaller than a storage transfer unit." Rabii does not introduce any notion of a storage transfer unit or objects of sizes smaller than a storage transfer unit. The final Office Action failed to address this deficiency other than to state (at page 11) that "transferring a fix [sic] amount, for example a cache line between the disk and a cache met the . . . definition."

The Examiner's Answer contends that "there is no limitation in the claim that requires 'the unit of storage transfer' to be a disk sector." This is because the phrase "storage transfer unit" is intended to refer not only to a disk sector but also to any other similar fixed, minimum unit of transfer between two different storage media. In fact, the cited portion of the specification states that a "sector" refers not only to a disk sector but also to any fixed unit of transfer between two different

storage media. A "data chunk such as one or more cache lines," which is not even fixed, is not the same as a sector, a fixed unit of transfer, or "a storage transfer unit" (as claimed). Thus, Rabii does not relate to managing storage of "objects of sizes smaller than a storage transfer unit" (as claimed).

Point (B) of the Examiner's Answer challenges Appellant's assertion that Rabii does not teach or suggest maintaining a plurality of storage transfer units in a first storage medium organized by a quantity of free space in a storage transfer unit.

The final Office Action contended that Rabii discloses the first step of claim 1 (i.e., maintaining a plurality of storage transfer units in a first storage medium organized by a quantity of free space in a storage transfer unit). In the Appeal Brief, Appellant stated that data object partitions of Rabii are not the same as storage transfer units of the claimed invention. There is no support given in the final Office Action or in Rabii to conclude otherwise. Secondly, Rabii does not organize such data object partitions by a quantity of free space, as the claimed invention recites with respect to storage transfer units. Nothing on page 3 or Fig. 5 of Rabii (as mentioned in the Examiner's Answer) supports an assertion otherwise.

Furthermore, Appellant reasserts that Rabii fails to disclose the second step of claim 1 (i.e., maintaining in a second storage medium a cache comprising a copy of at least one of said plurality of storage transfer units), again since there is no notion of storage transfer units maintained in the data buffers of FIG. 10 of Rabii. The Examiner's Answer mentions paragraphs 102-104 of Rabii, however, there is no disclosure of maintaining in a second storage medium a cache comprising a copy of at least one of said plurality of storage transfer units.

Appellant notes that the Examiner's Answer fails to address the argument in the Appeal Brief regarding the use of the Mattis reference in the cited combination. Mattis discloses a method for managing an object cache, i.e., the data objects are stored directly in the cache. The claimed invention recites storing an object of a size less than a storage transfer unit in a storage transfer unit of the cache (which is maintained in the second storage medium) and then writing a cached copy of the storage transfer unit to the first storage medium. This extra level of indirection in the claimed invention further distinguishes it from Mattis.

Point (C) of the Examiner's Answer challenges Appellant's assertion that the combination of Rabii and Mattis is improper. These two cited references are solving completely different problems. Rabii is directed to the problems associated with maintaining directory structures on a disk, while Mattis is directed to the problems associated with managing an object cache. Thus, it is not clear <u>how</u> or <u>why</u> one would combine the two disparate references.

Appellant respectfully submits that the statements provided by the Examiner both in the final Office Action and the Examiner's Answer are conclusory statements of the sort rejected by both the Federal Circuit and the U.S. Supreme Court. See <u>KSR v. Teleflex</u>, No. 13-1450, slip. op. at 14 (U.S., Apr. 30, 2007), quoting <u>In re Kahn</u>, 441 F. 3d 977, 988 (Fed. Cir. 2006) ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness."). There has been no showing in the present §103(a) rejection of the independent claims of objective evidence of record that would motivate one skilled in the art to combine Rabii and Mattis to produce the particular limitations in question. The statements of motivation provided by the Examiner appear to be conclusory statements of the type ruled insufficient in <u>KSR v. Teleflex</u>. In fact, there is no clear explanation in the final Office Action or the Examiner's Amendment that Rabii and Mattis are even combinable. A proper case of obviousness is not established by making unsupported statements about "availability and integrity of data stored in a storage system."

For at least these reasons, Appellant reasserts that independent claim 1 and independent claims 25 and 27 (which contain similar limitations as independent claim 1) are patentable over the Rabii/Mattis combination. Furthermore, Appellant reasserts that the claims which depend from claim 1 are patentable over the Rabii/Mattis combination not only for the reasons given above with respect to claim 1, but also because such dependent claims recite patentable subject matter in their own right, as will be set out below.

Point (D) of the Examiner's Answer relates to independent claim 16. Appellant reasserts that neither Rabii nor Mattis, alone or in combination, teach or suggest all of the limitations of the claimed invention. The rationale for rejecting the claim is still deficient since various limitations

in claim 16 are not disclosed by the cited combination. By way of example only, there is nothing the same or analogous in the cited combination to the claimed features of "storage transfer units" and "object offsets," and how they relate to one another. Also, Rabii is silent to copying a storage transfer unit, in response to a request to one of access and update a storage transfer unit, so that different objects are copied into different buffers.
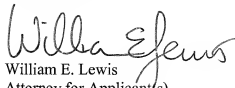
Further, the Rabii/Mattis combination is improper, as explained above.

For at least these reasons, Appellant reasserts that independent claim 16 and independent claims 26 and 28 (which include similar limitations as independent claim 16) are patentable over the Rabii/Mattis combination. Furthermore, Appellant reasserts that the claims which depend from claim 16 are patentable over the Rabii/Mattis combination not only for the reasons given above with respect to claim 16, but also because such dependent claims recite patentable subject matter in their own right, as will be set out below.

Regarding Points (E) through (I), directed toward the dependent claims of the present application, Appellant reasserts the arguments presented in the Appeal Brief. It is asserted that nothing in the Examiner's Answer removes the deficiencies of the rationale for rejection pointed out in the Appeal Brief regarding Rabii, Mattis, Chen, Cabrera and Garthwaite.

In view of the above, Appellant believes that claims 1-28 are in condition for allowance, and respectfully request withdrawal of the various §103(a) rejections.

Respectfully submitted,

Date: January 31, 2008

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